CLAIMS

1. A method for splicing data streams of MPEG-compressed programs, the program data being carried in MPEG transport streams of data packets having program clock references referring to an MPEG encoder system clock, the data packets carrying application data, such as video and audio data, and a header provided with control data, the method including the steps of:

-receiving a first input transport stream of first data packets (1);

-receiving a second input transport stream (1) of second data packets to replace selected first data packets in said first stream;

-extracting for each data packet a time reference and data packet status information indicating the syntactic function of the data packet;

characterised in the steps of:

-establishing for each data packet a control data object storing said time reference and said data packet status information;-establishing for ordered sets of said first data packets corresponding ordered sets of control data objects;

-establishing for said ordered sets of control data objects other control data objects storing information pertaining to different logical structures such as frames, sequences of frames and packetized elementary stream packets;-queueing the control data objects in different queues dependent on the data packet status or on the status of a group of data packets;-selecting from the queues control data objects associated to data packets to be output in an output stream of data packets;-assembling selected control data objects to a program of associated data packets of different kinds of data;-assembling data packets associated to said selected and assembled control data objects to an output stream (3) of data packets;

-outputting said assembled stream (3) of data packets.

2. The method for splicing programs as recited in claim 1, wherein the step of assembling data packets to an output stream comprises the further step of generating and inserting padding packets to fill out unutilised space in terms of free bandwidth of the output transport stream.

3. The method for splicing programs as recited in claim 1, wherein the control objects are used to generate control information for operating on associated data packets.

4. The method for splicing programs as recited in claim 1, wherein data packets are marked as available or non-available for replacement, and non-available data packets being left intact and reassembled into the output stream of data packets.

5. The method for splicing programs as recited in claim 1, wherein said operations are carried out on different layers of the transport streams generating different layers of abstraction of control data objects.

6. The method for splicing programs as recited in claim 1, further comprising the steps of:

-genlocking to an encoder clock of a received first input transport stream (1) wherein some packets include a program clock reference;

-determining according to said clock an arrival time in the shape of a local clock reference of every transport stream packet in the incoming transport stream (1), the local clock references carrying information about which positions within a transport stream at which all its transport stream packets arrived.

7. The method for splicing programs as recited in claim 1, further comprising the steps of:

-genlocking to an encoder clock of a received second input transport stream (2) wherein some packets include a program clock reference;

-determining according to said clock an arrival time in the shape of a local clock reference of every transport stream packet in the incoming master transport stream, the local clock references carrying information about which positions within a transport stream at which all its transport stream packets arrived.

8. The method for splicing programs as recited in claim 1, further comprising the step of:

-translating the time base of said second input transport stream to the time base of said first input transport stream.

9. The method for splicing programs as recited in claim 1, wherein video pictures comprised in the transport streams are arranged in groups-of-pictures such that each I-picture belongs to a group-of-pictures which does not depend on any previous pictures as reference for its decoding, called a closed group-of-pictures; further comprising the step of:

-generating, for an intra-coded I-picture a closed group-of-pictures property by eliminating the unwanted B-pictures that have an earlier presentation time than said I-picture.

10. The method for splicing programs as recited in claim 1, further comprising the steps of:

-selecting one of two candidate I-pictures at which the first input transport stream is re-entered dependent on a current program delay and the time distance from a desired switch time to a presentation time stamp of each candidate I-picture.

11. The method for splicing programs as recited in claim 1, further comprising the step of controlling buffer violations in the decoder by using free bandwidth in the form of empty packets in said first program's transport stream to re-schedule transport packets in said transport stream thereby disallowing overflow or underflow in said decoders buffers.

12. An apparatus for splicing data streams in MPEG-compressed programs, the program data being carried in MPEG transport streams of data packets having program clock references referring to an MPEG encoder system clock, the data packets carrying application data, such as video and audio data, and a header provided with control data, the apparatus having means for:

-means (4) for receiving a first input transport stream (1) of first data packets;

-means (5) for receiving a second input transport stream (2) of second data packets to replace selected first data packets in said first stream (1);

-means for extracting for each data packet a time reference and data packet status information indicating the syntactic function of the data packet;

characterised in

-means (6,7,8) for establishing for each data packet a control data object storing said time reference and said data packet status information;-means (6,7,8) for establishing for ordered sets of said first data packets corresponding ordered sets of control data objects;

-means (6,7,8) for establishing for said ordered sets of control data objects other control data objects storing information pertaining to different logical structures of higher level than the data packets such as frames, sequences of frames and packetized elementary stream packets;-means (11,12) for queueing the control data objects in different queues dependent on the data packet status or on the status of a group of data packets;-means (13,15) for selecting from the queues control objects associated to data packets to be output in an output stream of data packets;-means (17) for assembling selected control objects to a program of associated data packets of different kinds of data;-means (25) for assembling data packets associated to said selected and assembled control data objects to an output stream (3) of data packets;

-means (20) for outputting said assembled stream (3) of data packets.

13. The apparatus for splicing programs as recited in claim 12, wherein the means for assembling (25) data packets to an output stream is devised to generate padding packets to fill out unutilized space in terms of free bandwidth of the output transport stream.

14. The apparatus for splicing programs as recited in claim 12, comprising means for using the control objects to generate control information for operating on associated data packets.

15. The apparatus for splicing programs as recited in claim 12, comprising means for marking data packets as available or non-available for replacement, and means for leaving non-available data packets intact and reassembled into the output stream of data packets.

16. The apparatus for splicing programs as recited in claim 12, comprising means for carrying out operations on different layers of the transport streams generating different levels of abstraction of control data objects.

17. The apparatus for splicing programs as recited in claim 12, further comprising:

-means for genlocking to an encoder clock of a received first input transport stream wherein some packets include a program clock reference;

-means for determining according to said clock an arrival time in the shape of a local clock reference of every transport stream packet in the incoming first input transport stream , the local clock references carrying information about which positions within a transport stream at which all its transport stream packets arrived.

18. The apparatus for splicing programs as recited in claim 12, further comprising:

-means for genlocking to an encoder clock of a received second input transport stream wherein some packets include a program clock reference;

-means for determining according to said clock an arrival time in the shape of a local clock reference of every transport stream packet in the incoming first input transport stream, the local clock references carrying information about which positions within a transport stream at which all its transport stream packets arrived.

19. The apparatus for splicing programs as recited in claim 12, further comprising:

-means for translating the time base of said second input transport stream to the time base of said first input transport stream.

20. The apparatus for splicing programs as recited in claim 12, wherein video pictures comprised in the transport streams are arranged in groups-of-pictures such that each I-picture belongs to a group-of-pictures which does not depend on any previous pictures as reference for its decoding, called a closed group-of-pictures;

further comprising:

-means for generating, for an intra-coded I-picture, a closed group-of-pictures property by eliminating the unwanted B-pictures that have an earlier presentation time than said I-picture.

21. The apparatus for splicing programs as recited in claim 12, further comprising:

-means for selecting one of two candidate I-pictures at which the first input transport stream is re-entered dependent on a current program delay and the time distance from a desired switch time to a presentation time stamp of each candidate I-picture.

22. The apparatus for splicing programs as recited in claim 12, further comprising means for controlling buffer violations in the decoder by using free bandwidth in empty packets in said first input transport stream to re-schedule transport packets in said transport stream thereby disallowing overflow or underflow in said decoders buffers.

23. A computer program product for splicing data streams in MPEG-compressed programs, the program data being carried in MPEG transport streams of data packets having program clock references referring to an MPEG encoder system clock, the data packets carrying application data, such as video and audio data, and a header provided with control data, the computer program product comprising a recording medium and being **characterised in** means, recorded on the recording medium, to direct a computer to perform the steps and the functions as recited in any of the claims 1-22.